



NAMIBIAN CIVIL AVIATION AUTHORITY

Advisory Pamphlet (AP)

ANSSO-FPD-AP173/02

GUIDANCE ON CONSTRUCTION OF FLIGHT PROCEDURES

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GUIDANCE ON CONSTRUCTION OF FLIGHT PROCEDURES

1. PURPOSE

This Advisory Pamphlet (AP) provides guidance and information to Flight Procedure Design organisations on the construction of flight procedure designs to meet the requirements of the NAMCAR, Part 173.

2. BACKGROUND

- (a) The NAM-CARs Part 173 requires a flight procedure design organisation to ensure that the procedures are designed in accordance with prescribed requirements.
- (b) The NAM-CAR Parts 173 also requires a flight procedure design organisation to ensure that the designed instrument flight procedures undergo the validation process as applicable in accordance with prescribed standards.
- (c) The NAM-CAR Part 173 also requires a flight procedure design organisation to establish a procedures for verifying every instrument flight procedures that it publishes in the Aeronautical Information Publication.
- (d) In addition, the NAMCAR Part 173 requires a flight procedure design organisation to utilize design automation tools to the maximum extent practicable in the design of each instrument flight procedure in order to minimize the potential for design errors.
- (e) Below are the extracts from the Civil Aviation Regulations to which this Advisory Pamphlet apply.

3. EXTRACTS FROM NAM-CARS, PART 173 – FLIGHT PROCEDURE DESIGN SERVICES

173.04.2 Standards for the Design of instrument flight procedures (IFP)

- (1) A flight procedure design organisation designing an instrument flight procedure under the organisation's procedure design approval must ensure that the procedure is designed in accordance with -

- (a) the design requirements set out in the current version of the ICAO PANS-OPS (Doc 8168);
- (b) the design requirements set out or referred to in the current version of the ICAO Required Navigation Performance Authorisation Required Procedure Design Manual (Doc 9905);
- (c) the quality assurance, training, and validation and associated requirements set out in the current version of the ICAO Quality Assurance Manual for Flight Procedure Design (Doc 9906) – Volume 1 to Volume 6; and
- (d) any applicable standards and requirements set out in Document NAM-CATS-FPD.

173.04.3 Verification of instrument flight procedures

- (1) A flight procedure design organisation must establish a procedure for verifying every flight procedure that it proposes to design, make available for operational use, and publish the flight procedure in the AIP.

173.04.4 Procedures for validation of instrument flight procedures

- (1) A flight procedure design organisation must ensure that the designed instrument flight procedures undergo the validation process as applicable in accordance with standards prescribed in Documents NAM-CATS-FPD and subject to any conditions as may be specified in the approval.
- (2) Where a flight procedure design organisation has been approved to conduct validation of instrument flight procedures, it must ensure that each instrument flight procedure designed under its approval is validated in accordance with this Part and applicable standards set out in Document NAM-CATS-FPD.

4. EXTRACTS FROM NAM-CATS-FPD

173.04.2 STANDARDS FOR THE DESIGN OF INSTRUMENT FLIGHT PROCEDURES

2. Design of Instrument Flight Procedures

- 2.1 A flight procedure design organisation must establish detailed procedures for ensuring that every IFP developed is:
 - (a) designed or amended using the applicable design criteria;

- (b) independently verified by a qualified person who is independent of the person directly responsible for the design; and
- (c) validated as required by this Part 173.

3. Use of Design Automation Tools

- 3.1 An approved designer must utilize design automation tools to the maximum extent practicable in the design of each IFP in order to minimize the potential for design errors.

173.04.4 PROCEDURES FOR VALIDATION OF INSTRUMENT FLIGHT PROCEDURES

1.1 Validation

- 1.1.1 Validation is the necessary final quality assurance step in the procedure design process, prior to publication. The purpose of validation is the verification of all obstacle and navigation data, and assessment of flyability of the procedure. Validation normally consists of ground validation and/or flight validation.
- 1.1.2 Ground validation must always be undertaken. Where ground validation can verify the accuracy and completeness of all obstacle and navigation data considered in the procedure design, and any other factors normally considered in the flight validation, then the flight validation requirement may be dispensed with.
- 1.1.3 Validation is essential before the procedure design documentation can be issued as part of the integrated aeronautical information package.

1.2 The validation process

- 1.2.1 Full validation process includes a ground validation and a flight validation.
- 1.2.2 Ground validation must always be undertaken. Ground validation comprises a systematic review of the steps and calculations involved in the procedure design as well as the impact of the procedure on flight operations. It must be performed by persons trained in flight procedure design and with appropriate knowledge of flight validation issues.

- 1.2.3 If it can be verified, through ground validation, the accuracy and completeness of all obstacle and navigation data considered in the procedure design, and any other factors normally considered in the flight validation, then the flight validation requirement may be dispensed with.
- 1.2.4 Flight validation of instrument flight procedures must be carried out where the flyability of a procedure or the accuracy and/or integrity of obstacle and terrain data cannot be determined by other means. Flight validation must also be required where the procedure requires mitigation for deviations from design criteria, or where new procedures are being introduced and which differ significantly from existing procedures. Flight validation must be carried out for helicopter PinS procedures.
- 1.2.5 Detailed Guidance on the validation process is contained in Advisory Pamphlet ANSSO-FPD-AP173/03.

GENERAL GUIDANCE ON CONSTRUCTION OF FLIGHT PROCEDURES

1.0 GENERAL GUIDANCE

1.1. Introduction

- 1.1.1. This Advisory Pamphlet (AP) provides general guidance and information on construction of instrument and visual flight procedures for publication in the Aeronautical Information Publication. This AP provides guidance to a flight procedure design (FPD) organisation to ensure that the procedures are designed, validated, verified and published in accordance with prescribed requirements.

1.2. Scope

- 1.2.1 Flight Procedures considered in this advisory pamphlet include conventional and RNAV departure, arrival and approach including non precision and precision approaches.
- 1.2.2 The PANS OPS criteria contained in ICAO Doc 8168- PANS-OPS/611 must be applied in developing instrument approach procedures.
- 1.2.3 The design and format for instrument approach procedure charts must be in accordance with ICAO Annex 4 and ICAO Doc 8697.

1.3. Organizational Responsibilities for Flight Procedures.

- 1.3.1 A flight procedure design organisation is responsible for planning, construction, and publication of flight procedures. The NCAA is responsible for the provision of standards and approval of the flight procedures.
- 1.3.2 On receipt of a request for approval of a flight procedure for publication, the inspectors of the NCAA will evaluate the proposal including the supporting documentation and respond to the applicant.

1.4 Requirement for new procedures

- 1.4.1 Where an operational requirement exists for a new flight procedure, the approved flight procedure design organisation must ensure that such procedure is designed in accordance with prescribed standards and submitted to the Executive Director for approval.
- 1.4.2 The approved flight procedure design organisation may consult with the NCAA in advance or during the design process to clarify on regulatory requirements.

1.5 Requirement for revision of flight procedures

- 1.5.1 Each flight procedure published in the AIP must be revised as follows:
- a) when a significant change to the obstacle environment occurs, requiring an amendment of procedural minimum altitudes;
 - b) when a published bearing, track or radial would fall into error by 1° , consequent on a change to magnetic variation or station declination;
 - c) to improve safety or operational efficiency, as identified by an interested party;
 - d) to accommodate changes to aircraft category or characteristics;
 - e) to accommodate route connectivity or airspace organisation change;
 - f) necessitated by changes to the supporting navigation facility;
 - g) to comply with amendments to applicable ICAO provisions and other international and national standards and recommended practices;
 - h) where a change in procedural attitude is required;
 - i) when a significant change occurs to aerodrome physical characteristics such as runways;
 - j) when any other significant change occurs to aeronautical, cultural or topographical data
- 1.5.2 Each procedure should be reassessed at least yearly and a revision proposed if necessary.

1.6 Airspace Organization

1.6.1 Instrument flight paths should be contained within controlled airspace, where established.

1.6.2 Where instrument flight paths are contained within controlled airspace which lies above uncontrolled airspace, the minimum procedural altitude should be at least 500ft above the base of the controlled airspace.

1.6.3 Any proposal to establish a terminal instrument flight path in uncontrolled airspace will require a safety assessment including consideration of types and density of air traffic, risk analysis and acceptable mitigation.

1.7 Flight Procedure Construction Principles

In addition to the primary consideration of obstacle clearance, flight procedures should be safe, simple and economic in terms of time and airspace. Consistency between different procedures to the same runway should be applied to the extent feasible e.g. harmonization of platform altitudes and FAFs.

1.8 Supporting Documentation

1.8.1 Documentation to be included with flight procedures submitted for approval should include, as appropriate:

- a) obstacle survey data including dates of last full and update surveys;
- b) airfield and navigation facility data;
- c) diagram of each segment and holding areas showing dominant obstacles;
- d) procedural and minimum altitudes for each segment;
- e) track guidance;
- f) chart depicting the procedure;
- g) textual or abbreviated description and path terminators where applicable;
- h) associated positional data e.g. co-ordinates, bearings, distances;
- i) description of methodology and options considered;
- j) sufficient detail of significant calculation and design data to enable the proposal to be validated;
- k) other information considered relevant in support of the request for approval

1.9 Quality Assurance

1.9.1 The quality requirements for the procedures must conform to ICAO Doc 9906 – AN/472 Quality Assurance Manual for Flight Procedure Design.

1.9.2 Working Practices

- a) **Use of software.** Where practicable calculation and drawing of flight paths and protected areas should be done using accredited software.
- b) **Data Processing.** Data processing and transfer techniques must, where practicable, be based on electronic rather than manual methods. Techniques for deriving positional data must ensure that accuracy, resolution and integrity of such data complies with ICAO Doc 9674 AN/946 (WGS-84 Manual).

1.9.3 **Survey and Charting Accuracies.** Account must be taken of survey and charting accuracies by adding vertical and horizontal tolerances, as deemed appropriate.

1.10 Exceptions from PANS-OPS Criteria;

Any exceptions from PANS-OPS criteria applied in the procedure construction should be identified. Such exceptions will require to be considered in conjunction with operators before approval for publication is issued. Only where an identifiable operational advantage can be gained, without compromising safety taking account of the local environment will exceptions to the PANS-OPS criteria be accepted.

1.11 Consultation with User Representatives

The flight procedure design organisation is advised to consult with user representatives, where feasible, before submission of new procedures, particularly where there are complexities in the design. Such consultation may be informal but a note of the outcome may be included with the supporting documentation. During the evaluation process a determination will be made as to whether formal consultation with user representatives is required.

1.12 Terms of Reference for Procedure Designers

The flight procedure design organisation must develop terms of reference of personnel responsible for the construction of visual and instrument flight procedures.

1.13 Resource Requirements

1.13.1 The FPD organisation providing an instrument flight procedure service must have available, equipment that is appropriate for the design, design verification, validation, and maintenance of all the types of instrument flight procedure that are designed by the entity. Although some of the services like flight validation may be contracted out, the FPD organisation must ensure that the provisions regarding flight validation pilot qualifications and training requirements specified in this AP are complied with.

1.13.2 The FPD organisation providing an instrument flight procedure service should have access to relevant and current data including, but not limited to, aeronautical data, land contour data, and obstacle data for the design, design verification, flight validation, and maintenance of the instrument flight procedures developed by, and maintained by, the organization.

1.13.3 The FPD organisation providing an instrument flight procedure service should hold or have ready access to copies of relevant documentation comprising technical standards, practices, and instructions, and any other documentation that may be necessary for the design, design verification, flight validation, and maintenance of all the types of instrument flight procedures.

1.13.4 The FPD organisation providing an instrument flight procedure service must establish a procedure for ensuring that:-

- a) personnel have access to the data referred to in paragraph 1.13.2 for all the types of instrument flight procedures; and
- b) the data is current, traceable, and meets the required level of verifiable accuracy for the design, design verification, flight validation, and maintenance of instrument flight procedures.

1.13.5 The FPD organisation providing an instrument flight procedure service must establish a procedure for controlling all documentation required by paragraph 1.13.3 to ensure that—

- a) the documentation is reviewed and authorized by an appropriate person before issue and use; and
- b) current issues of relevant documentation are available to personnel if they need access to the documentation; and
- c) every obsolete document is promptly removed from every point of issue and use; and
- d) a change to documentation is reviewed and authorized by an appropriate person before issue and use; and
- e) the current version of every item of documentation can be identified to prevent the use of superseded material.

1.14 Management of records

1.14.1 The IFP design organisation providing an instrument flight procedure service must establish procedures for the management of records that are required for the organization's functions relating to the design, certification and maintenance of instrument flight procedures.

1.14.2 The management of records under paragraph (a) includes the identification, collection, indexing, storage, safekeeping, accessibility, maintenance and disposal of records.

2. DESIGN OF INSTRUMENT FLIGHT PROCEDURES

2.1 General

2.1.1 The FPD organisation providing an instrument flight procedure service must establish procedures for ensuring that every instrument flight procedure, is:-

- a) designed or amended using methods which ensure that the procedure meets the applicable requirements and standards as listed in Section 2.2 of this AP; and
- b) independently verified, before flight validation, by a qualified person who is independent of the person directly responsible for the design; and
- c) flight validated in accordance with the procedures required under paragraph (b), to ensure that—
 - i) the instrument flight procedure allows aircraft using the procedure to manoeuvre consistently within safe operating practices and pilot

workloads for the categories of aircraft that the procedure is intended for; and

- ii) the instrument flight procedure provides azimuth and distance information, and vertical guidance information for a precision approach, in accordance with ICAO standards for the operation of aircraft to ensure that an aircraft using the procedure remains clear of obstacles; and
- iii) visual guidance systems and cues for the runway are appropriate for the instrument flight procedure and are not confused by lighting, laser sky displays, or any other visual distraction.

2.1.2 The flight procedure design organisation must establish procedures for conducting the flight validation of an instrument flight procedure as specified in 2.1.1 (c) above.

2.1.3 The flight validation procedures must include the use of equipment that—

- a) have the precision, and accuracy traceable to appropriate standards, that are necessary for the validation being performed; and
- b) have known measurement uncertainties including, but not limited to, the software, firmware and crosswind uncertainties; and
- c) record the actual flight path of the validation aircraft, and
- d) are checked before being released for use, and at intervals not exceeding the calibration intervals recommended by the manufacturer, to establish that the system is capable of verifying the integrity of the instrument flight procedure, and
- e) are operated in accordance with flight validation system procedures and criteria by persons who are competent and current on the system used.

2.2 Design Criteria—Instrument Flight Procedures

2.2.1 Procedures must be designed according to ICAO Doc 8168 – PANSOPS criteria. Coordination with all concerned parties must continue throughout the procedure design and validation process to ensure that the procedure meets the needs of the user and the community

- 2.2.2 Each new or revised procedure must be verified by a person(s) trained in procedure design other than the one who designed the procedure, to ensure compliance with applicable criteria.
- 2.2.3 Published procedures must be subject to periodic review to ensure that they continue to comply with changing criteria, and meets user requirements. The maximum interval for this review is five years.
- 2.2.4 Instrument flight procedure designs must be accompanied by a narrative, which describes the procedure in textual format.
- 2.2.5 Every instrument flight procedure must be designed in accordance with the appropriate design processes, standards, guidelines, and aeronautical data quality requirements contained in the following documents:
- a) ICAO Documents—
 - i) Doc 8168, Procedures for Air Navigation Services – Aircraft Operations — Volume I Flight Procedures, and Volume II, Construction of Visual and Instrument Flight Procedures:
 - ii) Doc 8697, Aeronautical Chart Manual:
 - iii) Doc 9365, Manual of All-Weather Operations:
 - iv) Doc 9613 Performance Based Navigation Manual — Volume I Concept and Implementation Guidance, and Volume II Implementing RNAV and RNP:
 - v) Doc 9881, Guidelines for Electronic Terrain, Obstacle and Aerodrome Mapping Information:
 - vi) Doc 9274 - AN/904 Manual on the Use of the Collision Risk Model (CRM) for ILS operations;
 - vii) Doc 9368 - AN/911 Instrument Flight Procedure Construction Manual;
 - viii) Doc 9905 - Required Navigation Performance Authorization Required (RNP AR) Procedure Design Manual
 - ix) Doc 9906 - AN/472 Volume I, Quality Assurance Manual for Flight Procedure Design;
 - x) Doc 9674 - AN/946 World Geodetic System 1984 (WGS-84) Manual;
 - xi) ICAO; Manual on Airspace Planning Methodology for the Determination of Separation Minima Doc 9689;
 - xii) ICAO, Global Navigation Satellite System (GNSS) Manual, Doc 9849.

- b) Namibia civil aviation regulations and standards (NAMCARs/NAMCATS) contained in—
 - i) Part 172 – Air traffic services
 - ii) Parts 121, 127, 135 (Flight Operations)
 - iii) Part 173 – Flight procedure design services
 - iv) Part 175 – Aeronautical information services
 - v) Part 139 – Aerodromes operations
- c) Any other guideline or standard that is applicable to a particular type of instrument flight procedure and is acceptable to the Executive Director.

2.2.6 The design of an instrument flight procedure must—

- a) be coordinated with all appropriate air traffic service providers; and
- b) be compatible with any air traffic service and associated procedure that is provided within the area or areas of airspace where the instrument flight procedure is intended to be established; and
- c) take into account—
 - i) any noise abatement procedures
 - ii) any bylaws or other legislation restricting aircraft operations; and
 - iii) the classification and any associated designation of the airspace in which the instrument flight procedure is to be established and any adjacent airspace that may be affected by the procedure; and
 - iv) the effect that the proposed instrument flight procedure may have on any other instrument flight procedure established in the airspace.

2.2.7 An instrument flight procedure must not be designed on or use a ground based aeronautical facility unless the aeronautical facility is installed and operated in accordance with the provisions of NAMCAR/NAMCATS Part 171.

2.3 Information Acquisition

- 2.3.1 Current and complete survey data and information is crucial to the design of safe IFP. The IFP design organisation must ensure that the survey and subsequent IFP design activities are controlled and monitored by a person(s) trained in procedure design.
- 2.3.2 In the obstacle survey for procedure design, the IFP designer must consider that:
- a) all obstacles be accounted for. Items, such as trees and heights of tall buildings must be accounted for either by physical examination of the site or by addition of a suitable margin above terrain contours; and
 - b) the accuracy of the vertical and horizontal data obtained may be adjusted by adding an amount equal to the specified survey error to the height of all measured obstructions and by making a corresponding adjustment for specified horizontal error.
- 2.3.3 The procedure design information must be coordinated with all relevant stakeholders. As input for the procedure design process the following aspects need to be assessed:
- a) airport, navigation aid, obstacle, terrain coordinate and elevation data, based on verified surveys and complying with the standards prescribed in NAMCARS Part 172 (Air traffic services, Part 175 (Aeronautical information services) and Part 139 (Aerodromes operations);
 - b) airspace requirements;
 - c) user requirements – the needs of air traffic service provider and operators who will use this procedure;
 - d) airport infrastructure such as runway classification, lighting, communications, runway markings, and availability of local altimeter setting;
 - e) environmental considerations; and
 - f) any other potential issue associated with the procedure.

2.4 Instrument flight procedure design process

- 2.4.1 The Instrument Flight Procedure Design process encompasses the acquisition of data, design and promulgation of procedures. It starts with compilation and verification of the many inputs and ends with ground and/or flight validation of the finished product, and documentation for publication.
- 2.4.2 The elements of the process encompass enablers, constraints, output, and post-publication feedback for the procedure under consideration. The instrument flight

procedure design process should be followed both for original procedure designs and periodic reviews of existing instrument flight procedures.

2.4.3 Appendix 1 of this AP illustrates the instrument flight procedure design process.

2.5 Procedure Design Documentation

2.5.1 The FPD organisation should ensure that all documents produced from the time the need for the design or amendment of a procedure is determined to the actual request for approval are retained.

2.5.2 The documentation provided by the IFP designer is divided into three categories and includes:

- a) documentation required for publication in the AIP in accordance with Manual of ANS Standards Part III;
- b) documentation required to maintain transparency concerning the details and assumptions used by the IFP designer, which should include supporting information/data used in the design, such as:
 - i) controlling obstacle for each segment of the procedure;
 - ii) effect of environmental considerations on the design of the procedure;
 - iii) infrastructure assessment;
 - iv) airspace constraints;
 - v) for modifications or amendments to existing procedures, the reasons for any changes; and
 - vi) for any deviation from existing standards, the reasons for such a deviation and details of the mitigations applied to assure continued safe operations.
- c) additional documentation required to facilitate ground and flight validation of the procedure.

2.5.3 All documentation must be retained to assist in recreating the procedure in the future in the case of incidents and for periodic review and maintenance. The periodic retention must not be less than the operational lifetime of the procedure.

2.6 Procedure designer qualification and training

2.6.1 The flight procedure design organisation (FPD) must ensure that flight procedures are designed by trained and qualified procedure designers. The FPD organisation must

ensure that flight procedure designers have acquired and maintain the required competency level through training and supervised on-the-job training (OJT). This is to ensure that the quality assurance in the procedure design process and its output, including the quality of aeronautical information/data, meets the requirements of NAMCAR Part 175.

- 2.6.2 Training for flight procedure design should at least include an initial training and recurrent training at periodic intervals.
- 2.6.3 Initial training must ensure that the flight procedure designer is able to demonstrate a basic level of competency that includes at least the following elements:
 - a) knowledge of information contained in the PANS-OPS, Volumes I and II and other related ICAO provisions relevant to the State; and
 - b) skills in the design of procedures.
- 2.6.4 Recurrent training must ensure that the flight procedure designer is able to demonstrate a basic level of competency that includes at least the following elements:
 - a) knowledge about updates in ICAO FPD provisions and other provisions pertaining to procedure design; and
 - b) maintenance and enhancement of knowledge and skills in the design of procedures.
- 2.6.5 The FPD organisation should ensure that flight procedure designers have undergone an adequate, supervised OJT.
- 2.6.6 Competency of the flight procedure designer must be evaluated by the inspectors of the NCAA at regular intervals as part of the safety oversight activity.
- 2.6.7 Guidance on training and qualification of flight procedure designers including planning, implementation and evaluation of flight procedure designer training is provided in Advisory Pamphlet ANSSO-FPD-AP173/01.

3. GROUND AND FLIGHT VALIDATION OF INSTRUMENT FLIGHT PROCEDURES

3.1 Validation

- 3.1.1 Validation of instrument flight procedures is the necessary final quality assurance step in the procedure design process, prior to publication. The purpose of validation is to verify all obstacle and navigation data, and to assess the flyability of the procedure.
- 3.1.2 Validation must consists of ground validation and flight validation. When ground validation can verify the accuracy and completeness of all obstacle and navigation data considered in the procedure design, and any other factors normally considered in the flight validation, then the flight validation requirement may be dispensed with.
- 3.1.3 The process for the validation of flight procedures is detailed in Advisory Pamphlet ANSSO-FPD-173/03.

3.2 Ground validation

- 3.2.1 Ground validation is a review of the entire instrument flight procedure package by a person(s) qualified in procedure design and with appropriate knowledge of flight validation issues. It is meant to arrest errors in criteria and documentation, and evaluate on the ground, to the extent possible, those elements that will be evaluated in a flight validation. Issues identified in the ground validation should be addressed prior to any flight validation.
- 3.2.2 The ground validation will also determine if flight validation is needed for modifications and amendments to previously published procedures.

3.3 Flight validation

- 3.3.1 Flight validation of instrument flight procedures should be carried out as part of the initial certification and should also be included as part of the periodic quality assurance programme. It must be accomplished by a qualified and experienced flight validation pilot, certified or approved by the Executive Director.
- 3.3.2 The objectives of the flight validation of instrument flight procedures are to:
 - a) provide assurance that adequate obstacle clearance has been provided;
 - b) verify that the navigation data to be published, as well as that used in the design of the procedure, is correct;
 - c) verify that all required infrastructure, such as runway markings, lighting, and communications and navigation sources, are in place and operative;

- d) conduct an assessment of flyability to determine that the procedure can be safely flown; and
- e) evaluate the charting, required infrastructure, visibility and other operational factors.

3.3.3 Flight validation should be a part of flight inspection. Flight inspection of instrument flight procedures is required to assure that the appropriate radio navigation aids adequately support the procedure. This is carried out as part of a formal flight inspection programme and is performed by a qualified flight inspector using an appropriately equipped aircraft.

3.3.4 The IFP designer must be the originator of all data applicable to conduct a flight validation provided to the flight inspection operations activity. The instrument flight procedure designer should be prepared to provide briefings to the flight inspection crews in those cases where flight procedures have unique application or special features.

3.3.5 The instrument flight procedure designer may participate in the initial validation flight to assist in its evaluation and obtain direct knowledge of issues related to the procedure's design from the flight inspection pilot and/or inspector.

3.4 Flight validation pilot qualifications and training

3.4.1 The minimum qualifications, recency of experience, training and competency level standards for flight validation pilots, including skills knowledge and attitudes requirements are described in Advisory Pamphlet ANSSO-FPD-AP173/03.

4. AUTOMATION OF PROCEDURE DESIGN

4.1 General

4.1.1 Procedure design automation tools have the potential to reduce errors in the procedure design process, as well as to standardize the application of the PANS-OPS criteria. The FPD organisation should therefore use the available software packages to design their instrument flight procedures.

4.1.2 The ICAO PANSOPS Obstacle Assessment Surface (OAS) Software and the PANSOPS Software (CD-101) are some of the tools provided by ICAO to assist in automating elementary portions of the procedure design criteria, where the consequences of error are particularly significant to safety. These tools provide a means to evaluate the total risk of impact with an obstacle or the ground on precision approaches.

4.1.3 There are numerous other software packages available that automate, to varying degrees, the application of PANS-OPS criteria to the procedure design. FPD should however note that while software developers test their software extensively, there is no absolute guarantee as to the accuracy of any individual application of the criteria. Some of the advantages of using these tools include:

- a) the ability to maintain the integrity of the source data throughout the design phase;
- b) reducing human errors;
- c) gaining the capability to develop “what-if” scenarios; and
- d) standardized application of the procedure design criteria.

4.1.4 The FPD organisation must ensure that the software packages it uses in the design of procedures have been validated. The FPD design organisation must also ensure that all equipment, including software is operated in accordance with the manufacturer’s operating instructions and manuals and are made readily available to its instrument flight procedure designers.

4.2 Validation of flight procedure design software

4.2.1 Guidance on the validation of flight procedure design software is provided in Advisory Pamphlet ANSS-FPD-AP173/04.

5. PUBLICATION OF INSTRUMENT FLIGHT PROCEDURES

5.1 The FPD organisation must establish a procedure to ensure that—

- a) an instrument flight procedure is not published or made available for operational use unless it has been validated and approved.
- b) the initial publication of, or any change to, an instrument flight has been accurately published.

- c) the date that the instrument flight procedure is intended to come into effect is clearly stated.
- d) The IFP design organisation must ensure that instrument flight procedures designs/charts, are provided to the Aeronautical Information Service (AIS) provider for publication in the AIP.
- e) The designs/charts published in the AIP must be produced in accordance with the provisions contained in the documents listed below:
 - i) ICAO Doc 8168 Volumes I and II - Procedures for Air Navigation Services – Aircraft Operations (PANS-OPS).
 - ii) ICAO Doc 8697 – Aeronautical Chart Manual.
 - iii) Manual of ANS Standards Part III – Section 1 and 2.

5.2 The aeronautical charts included in the AIP must be kept up-to-date by means of replacement sheets where necessary. Significant amendments or revisions in the IFP must be clearly indicated in the revised charts.

5.3 Errors in published instrument flight procedures

5.3.1 The FPD organisation providing an instrument flight procedure service must establish procedures for recording, investigating, correcting, and reporting, any identified error, and any identified non-conformance or suspected non-conformance with the standards and requirements of this section, in an instrument flight procedure that is approved or maintained by the entity.

5.3.2 The procedure required in paragraph 5.3.1 should include arrangements to ensure that—

- a) an instrument flight procedure is immediately withdrawn from operational use if the error or non-conformance referred to in paragraph 5.3.1 affects, or may affect, the safety of an aircraft operation; and
- b) the error or non-conformance is corrected, and certified by a senior person who is appropriately authorized.
- c) the correction required by paragraph (b) is clearly identified and promulgated by the most appropriate means relative to the operational significance of the error or non-conformance; and
- d) the source of the error or non-conformance is identified, and—
 - i) if possible, eliminated to prevent a recurrence; and

- ii) preventive action is taken to ensure that the source of the error or non-conformance has not affected the integrity of any other instrument flight procedure; and
- e) the Executive Director is immediately notified, of a promulgated information incident relating to an error or non-conformance.

6. MAINTENANCE OF INSTRUMENT FLIGHT PROCEDURES

- 6.1 The FPD organisation providing an instrument flight procedure service must establish procedures for maintenance of instrument flight procedures in accordance with the requirements of this section.
- 6.2 The procedures must include details of every instrument flight procedure to be reviewed, and flight validated if necessary —
 - a) on a periodic basis and at intervals of not more than five years to ensure that the instrument flight procedure continues to meet the applicable standards and requirements; and
 - b) if there is a change in any of the data that may affect the integrity of the instrument flight procedure.
- 6.3 The procedures must include and document the grounds and criteria for establishing or changing the interval between the periodic maintenance reviews for each instrument flight procedure.

APPENDIX 1

INSTRUMENT PROCEDURE DESIGN PROCESS

